



**U.S. DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
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## **CRUISE REPORT<sup>1</sup>**

**VESSEL:** *Oscar Elton Sette*, Cruise SE-11-08

**CRUISE PERIOD:** 20 October–18 November 2011

**AREA OF OPERATION:** Palmyra Atoll Exclusive Economic Zone (EEZ)

**TYPE OF OPERATION:** Conduct line-transect abundance surveys in the Palmyra Atoll EEZ in support of a Pacific Islands Fisheries Science Center research project to study cetaceans.

**ITINERARY:**

20 October	Embarked scientists Bradford, Rowlett, Yin, Ligon, Deakos, Reeb, Bendlin, Force, Joyce, Oedekoven, Barkley, Coates, Norris, Young, and Henry. Departed Pearl Harbor, HI at 0900. Transited to Palmyra Atoll EEZ study area. Conducted visual and acoustic surveys during daylight hours. Dropped expendable bathythermograph (XBT) at 1200 and 1500 and cast conductivity-temperature-depth (CTD) and sonobuoy at dusk.
21–23 October	Continued transit to Palmyra Atoll EEZ study area. Conducted visual and acoustic surveys during daylight hours. Dropped XBT at 0900, 1200, and 1500 and cast CTD and sonobuoy at dusk.
24 October–5 November	Surveyed the Palmyra Atoll EEZ study area. Conducted visual and acoustic surveys during daylight hours along standard transect lines. Conducted CTD before and after daytime operations. Dropped XBT at 0900, 1200, and 1500 and sonobuoy at dusk.
6 November	Day of liberty on Palmyra Atoll (Cooper Island).

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<sup>1</sup> PIFSC Cruise Report CR-12-001  
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7–14 November	Conducted visual and acoustic surveys during daylight hours along standard transect lines. Conducted CTD cast before and after daytime operations. Dropped XBT at 0900, 1200, and 1500 and sonobuoy at dusk.
15–17 November	Departed Palmyra Atoll EEZ study area and transited to Pearl Harbor, HI. Conducted visual and acoustic surveys during daylight hours on transit course. Dropped XBT at 0900, 1200, and 1500 and cast CTD and sonobuoy at dusk.
18 November	Returned to Pearl Harbor, HI. Disembarked all scientific personnel.

## **MISSIONS AND RESULTS:**

### **A. Cetacean line-transect survey**

#### *Methods*

Line-transect survey methods were used to collect cetacean data for abundance estimation. Search effort began on a given trackline at the beginning of each day. The ship travelled at 9-10 knots (through the water) along the designated trackline.

A daily watch for cetaceans was maintained by scientific observers on the flying bridge during daylight hours (approximately 0700 to 1830) unless precluded by weather. The observers consisted of six scientists that rotated through three positions every 40 minutes and scanned for cetaceans using 25 x and 7 x binoculars and unaided eyes. Sighting information, watch effort, viewing conditions, and other required information were entered into a computer attached to the ship's global positioning system (for course, speed, and position information) using the program Wincruz.

The set of standard tracklines surveyed was established prior to the cruise and was intended to cover approximately two thirds of the Palmyra Atoll EEZ transect line grid used for the 2005 Pacific Islands Cetacean Ecosystem and Assessment (PICEAS; AR-05-07) survey. Survey effort took place on transit paths to and from the study area and on circumnavigations of Palmyra Atoll and Kingman Reef, which were considered non-standard tracklines. When weather precluded surveying, the Chief Scientist decided whether to wait at a given position for better weather or to direct the ship to another location based on weather forecasts. The Chief Scientist adjusted scientific activities and length of nighttime transit to meet scientific and scheduling objectives.

Upon sighting a cetacean group or other feature of biological interest, the Chief Scientist or marine mammal observer team on watch requested that the ship be maneuvered to approach the group or other feature for investigation. When the ship approached a group of cetaceans, the on-effort observers made independent estimates of group size. Photographic operations occasionally commenced from the bow, based on directions from the Chief Scientist or Lead Mammal Observers.

When the observers completed scientific operations for a given sighting, the ship resumed the same course and speed as prior to the sighting. If pursuit of the sighting took the ship more than

5 nm from the trackline, the observers were notified. The Chief Scientist or Lead Mammal Observers sometimes requested that, rather than proceed directly toward the next waypoint, the ship take a heading of 20 degrees back toward the trackline.

It was occasionally necessary to divert the ship's course from the established trackline during regular effort because of glare or adverse sea conditions. Under these circumstances, the ship diverted from the established course until the ship was 3 nm from the trackline or otherwise directed by the observers, at which point the ship turned back toward the trackline.

At times during the cruise, visual survey operations were not possible due to high wind or sea state. Survey operations were usually suspended at Beaufort Sea State 7 or higher. If rain made visibility 1 nm or less, visual observations were also suspended until visibility increased. During these times, a single observer maintained a weather watch in order to notify the rest of the observer team when conditions improved.

### *Results*

Twenty-eight days of on-effort surveying (16 along standard and 12 along non-standard transect lines) were completed during the cruise (Table 1), resulting in 28 visual sightings of eight cetacean species and five types of unidentified cetaceans (Table 2). The geographic distribution of search effort and sightings within the Palmyra Atoll EEZ is shown in Figures 1 and 2, respectively. Sighting data will be combined with data collected during a 2012 spring survey to yield new abundance estimates for observed species.

### **B. Photo-identification and biopsy sampling**

#### *Methods*

Photographs of cetaceans were taken from the ship on an opportunistic basis. These images were used to confirm species identification and, when possible, will be used to study movement patterns of identified individuals and intraspecific geographic variation. Photographed animals were either approached by the ship as a part of normal survey operations or approached the ship to bow ride.

A small boat was launched on 2 days designated for photo-identification and biopsy sampling of cetaceans in the nearshore waters of Palmyra Atoll. These days were determined by transect scheduling and weather. The small boat also assisted the ship, which was circumnavigating Palmyra Atoll in more offshore waters, with sightings when deemed appropriate by the Chief Scientist.

Photographs were taken with digital SLR cameras, and biopsy samples were collected using darts fired from a crossbow. All photographs and biopsy samples were taken under permit. Necessary permits were present on the vessel.

### *Results*

Over 1,400 photographs of five cetacean species were collected from the ship during visual survey operations. The small boat operated in the nearshore waters of Palmyra on 4 and 7 November. The number of small boat photo-identification encounters and biopsy samples collected is summarized in Table 3.

### C. Passive acoustic monitoring

#### *Methods*

Two oil-filled, four-element hydrophone arrays (a primary and a backup) were available to augment the visual survey effort during this cruise. The primary array was towed at 300 m behind the ship during daylight hours to collect data on cetacean vocalizations and assist with the localization of target species. The array was deployed each morning prior to the start of visual observations and normally retrieved each evening after search effort ended (and whenever increased maneuverability of the ship was required).

The primary array contained two high-frequency elements and two mid-frequency elements. The backup array contained four high-frequency elements. On 27 October, the primary array came undone at the connector to the cable and was lost. The backup array was spliced to the cable and used for the remainder of the cruise.

Signals received from the array were amplified and monitored by a team of three acoustic technicians. The technicians rotated through a primary, secondary, and off-effort position every 2 hours while the array was deployed. When cetacean sounds were detected audibly or on the spectrogram display, incoming acoustic data were recorded to computer hard drives. A record was kept of acoustic effort, comments, and periodic acoustic updates using the program Logger. Real-time visual displays of sounds were monitored and localized using Ishmael and Whaltrak software. The localization angles created were plotted on the Whaltrak display and saved to corresponding files.

Sonobuoys were deployed every day before the evening CTD and could also be deployed opportunistically at the discretion of the Chief Scientist. Sonobuoys transmitted acoustic data over an RF carrier frequency received by a VHF radio on the ship. A VHF antenna was mounted on the trawl house on the 01 deck for reception of the sonobuoy's signals. The incoming signals were monitored for cetacean sounds using a scrolling spectrogram display in Ishmael and recorded to computer hard drives.

#### *Results*

A total of 56 acoustic detections of cetaceans were made from the towed hydrophone array. While 13 of the visual detections were not detected acoustically, 43 acoustic detections (mostly unidentified dolphin groups) were not detected visually (Table 4). A total of 23 sonobuoys were deployed, but no cetacean sounds were detected during monitoring. Additional processing of the hydrophone and sonobuoy acoustics data is ongoing.


#### D. High-frequency Acoustic Recording Package (HARP) Deployment

On 3 November, a High-frequency Acoustic Recording Package (HARP) was deployed at a depth of 859 m at N6°21.91, W°17.54, which is approximately 1.5 nmi ESE of Kingman Reef. The HARP was programmed to begin recording on 10 November. It is currently scheduled to be recovered during the spring 2012 survey.


#### **SCIENTIFIC PERSONNEL:**

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National Marine Fisheries Service (NMFS)  
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Submitted by:

  
Amanda L. Bradford  
Chief Scientist

Approved by:

  
Samuel G. Pooley  
Science Director  
Pacific Islands Fisheries Science Center

Attachments

# TABLES:

Table 1.--Visual and acoustic survey effort during SE-11-08.

Date	Survey Activity	START			END			Distance (nmi)
		Time	Latitude	Longitude	Time	Latitude	Longitude	
10/20/11	Transit	1222	N20°53.73	W158°05.85	1800	N19°58.76	W158°28.29	58.7
10/21/11	Transit	0638	N18°27.35	W159°05.72	1800	N16°43.27	W159°47.96	111.2
10/22/11	Transit	0634	N15°04.88	W160°27.60	1649	N13°32.37	W161°04.41	98.8
10/23/11	Transit	0647	N11°41.91	W161°48.25	1823	N10°12.90	W162°23.19	95.1
10/24/11	Standard	0644	N09°43.03	W162°35.19	1500	N08°35.07	W163°23.84	83.2
10/25/11	Standard	0652	N08°57.92	W164°22.52	1813	N07°29.62	W165°24.79	107.9
10/26/11	Standard	0647	N07°54.00	W164°27.78	1810	N06°56.10	W165°08.55	70.8
10/27/11	Standard	0655	N06°58.56	W164°31.71	1549	N06°01.90	W165°11.80	69.4
10/28/11	Standard	0657	N04°56.01	W165°21.06	1836	N06°23.71	W164°20.38	106.7
10/29/11	Standard	0653	N05°03.12	W164°38.73	1830	N06°39.21	W163°30.97	117.5
10/30/11	Standard	0655	N07°03.86	W163°13.51	1821	N08°44.81	W162°01.68	123.4
10/31/11	Standard	0639	N08°48.84	W161°22.51	1700	N07°30.11	W162°17.89	95.8
11/01/11	Standard	0733	N06°17.53	W162°35.10	1758	N04°54.91	W163°34.91	101.8
11/02/11	Standard	0645	N04°08.13	W163°26.69	1625	N05°24.08	W162°32.26	93.3
11/03/11	Kingman	0757	N06°01.64	W162°08.81	1640	N06°21.49	W162°26.44	47.3
11/04/11	Palmyra	0840	N05°55.62	W162°08.33	1630	N05°53.86	W162°10.93	73.3
11/05/11	Kingman	0804	N06°24.30	W162°30.01	0848	N06°21.20	W162°26.31	6.1
11/06/11	Liberty	No effort						
11/07/11	Palmyra	0830	N05°55.25	W162°09.45	1633	N05°54.56	W162°10.88	34.4
11/08/11	Standard	1005	N05°45.05	W161°37.67	1824	N04°41.63	W162°23.50	78.0
11/09/11	Standard	0641	N04°29.02	W161°57.53	1816	N05°51.15	W160°57.97	101.1
11/10/11	Standard	0634	N06°29.46	W160°31.03	1546	N07°43.93	W159°37.80	91.0
11/11/11	Standard	0639	N07°50.97	W160°09.80	1815	N06°22.89	W161°11.21	106.8
11/12/11	Standard	0745	N06°32.67	W162°24.24	1816	N07°56.98	W161°23.02	103.7
11/13/11	Standard	0642	N06°46.41	W161°34.04	1814	N08°21.61	W160°26.63	116.0
11/14/11	Transit	0650	N10°08.91	W160°12.44	1734	N11°45.26	W159°53.25	97.7
11/15/11	Transit	0640	N13°32.06	W159°31.80	1753	N15°19.15	W159°09.96	108.7
11/16/11	Transit	0645	N16°54.02	W158°50.79	1743	N18°37.35	W158°29.44	104.9
11/17/11	Transit	0704	N18°54.61	W157°56.60	1110	N19°19.68	W157°25.18	38.8
<b>Total</b>								<b>2,441.4</b>

Table 2.--All visual sightings of cetacean species made while on standard (S) or non-standard (NS) transect lines and while off-effort (O). Locations of all visual sightings within the Palmyra EEZ study area are shown in Figure 2.

Code	Scientific Name	Common Name	No. Sightings	Effort Type
3	<i>Stenella longirostris</i>	Spinner dolphin	1	NS
13	<i>Stenella coeruleoalba</i>	Striped dolphin	1	S
18	<i>Tursiops truncatus</i>	Bottlenose dolphin	4	NS
			3	O
21	<i>Grampus griseus</i>	Risso's dolphin	1	NS
33	<i>Pseudorca crassidens</i>	False killer whale	1	S
			1	O
36	<i>Globicephala macrorhynchus</i>	Short-finned pilot whale	1	S
46	<i>Physeter macrocephalus</i>	Sperm whale	1	NS
			1	O
49		Unidentified beaked whale	1	NS
51		Unidentified <i>Mesoplodon</i>	1	S
61	<i>Ziphius cavirostris</i>	Cuvier's beaked whale	1	NS
77		Unidentified dolphin	2	S
79		Unidentified large whale	3	S
177		Unidentified small delphinid	4	S
			1	O
<b>Total</b>			<b>28</b>	

Table 3.--Summary of sightings made during small boat surveys of the nearshore waters of Palmyra Atoll.

Date	Sighting No.	Species	Group Size	No. Photographs	No. Biopsies
11/04/11	1	Melon-headed whale	200	1,593	0
11/04/11	2 <sup>1</sup>	Melon-headed whale	100	719	0
		Bottlenose dolphin	7		0
11/04/11	3	Spinner dolphin	150	379	6
11/07/11	1	Bottlenose dolphin	19	6	0
11/07/11	2	Bottlenose dolphin	8	134	0
11/07/11	3 <sup>2</sup>	False killer whale	26	0	0
11/07/11	4	Bottlenose dolphin	3	22	0
11/07/11	5	Bottlenose dolphin	5	16	0
11/07/11	6	Bottlenose dolphin	19	44	0
11/07/11	7	Bottlenose dolphin	7	94	0
<b>Total</b>				<b>3,007</b>	<b>6</b>

<sup>1</sup>Sighting was a mixed species group.

<sup>2</sup>Small boat was requested to assist with ship sighting (Figure 2).



Table 4.--A comparison of the acoustic cetacean detections from the towed hydrophone array with those detected visually.

Species	Visually Detected	Visual Sightings Acoustically Detected	Only Acoustically Detected
Spinner dolphin	1	1	0
Striped dolphin	1	1	0
Bottlenose dolphin	7	6	0
Risso's dolphin	1	1	0
False killer whale	2	2	1
Short-finned pilot whale	1	1	0
Sperm whale	2	2	2
Unidentified beaked whale	1	0	0
Unidentified <i>Mesoplodon</i>	1	0	0
Cuvier's beaked whale	1	0	0
Unidentified dolphin	2	0	38
Unidentified large whale	3	0	0
Unidentified small delphinid	5	1	0
Unidentified cetacean	0	N/A	2
<b>Total</b>	<b>28</b>	<b>15<sup>1</sup></b>	<b>43</b>

<sup>1</sup>The visual spinner dolphin detection and one of the visual bottlenose dolphin detections were recorded as single acoustic detection, and two more of the visual bottlenose dolphin detections were recorded as a single acoustic detection.

**FIGURES:**

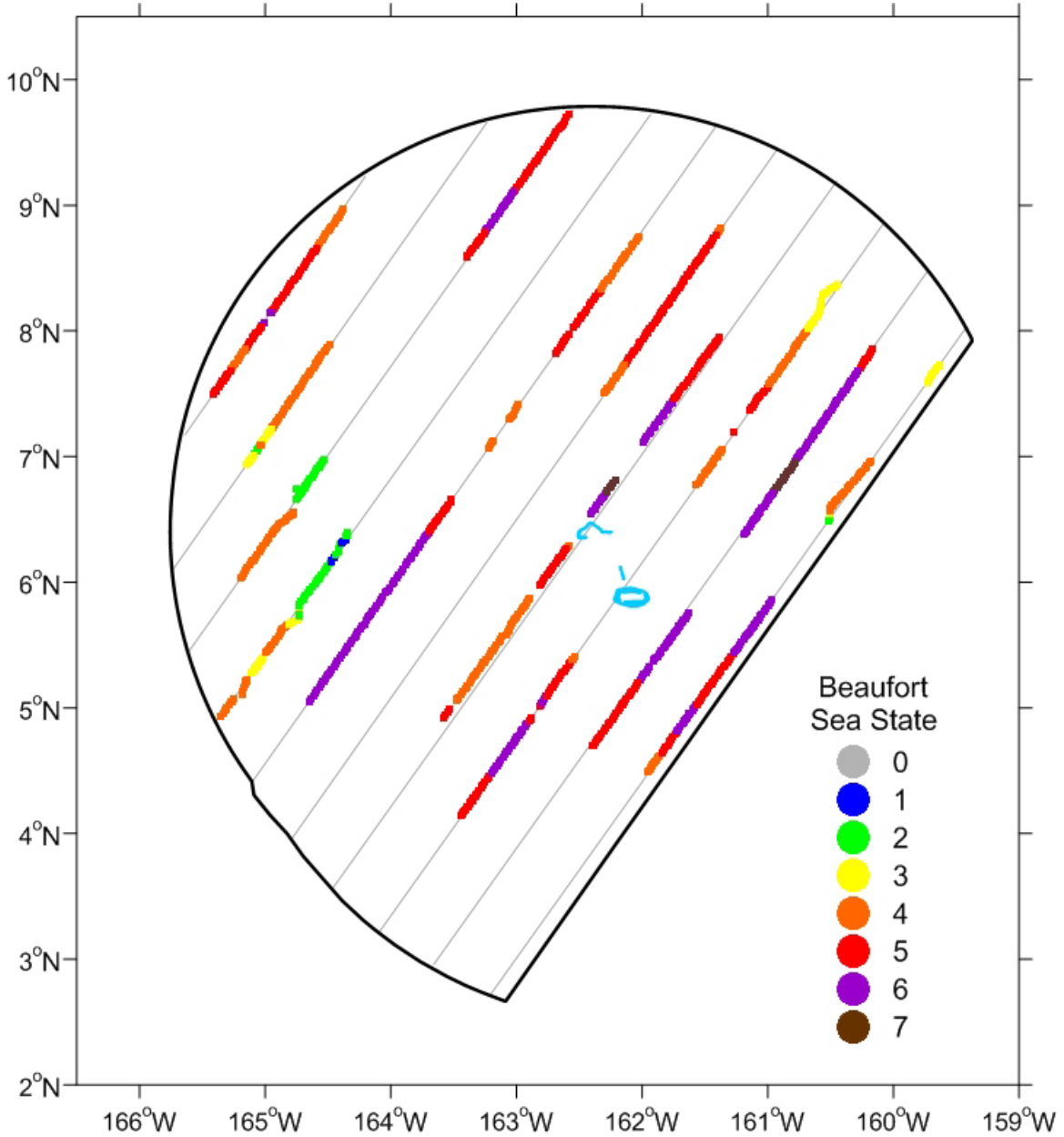


Figure 1.--Survey effort (dotted colored lines) along standard tracklines by Beaufort Sea State within the Palmyra Atoll EEZ (black outline). The sky blue lines show non-standard effort around Palmyra Atoll and Kingman Reef. The light gray lines represent the full 2005 PICEAS trackline grid.

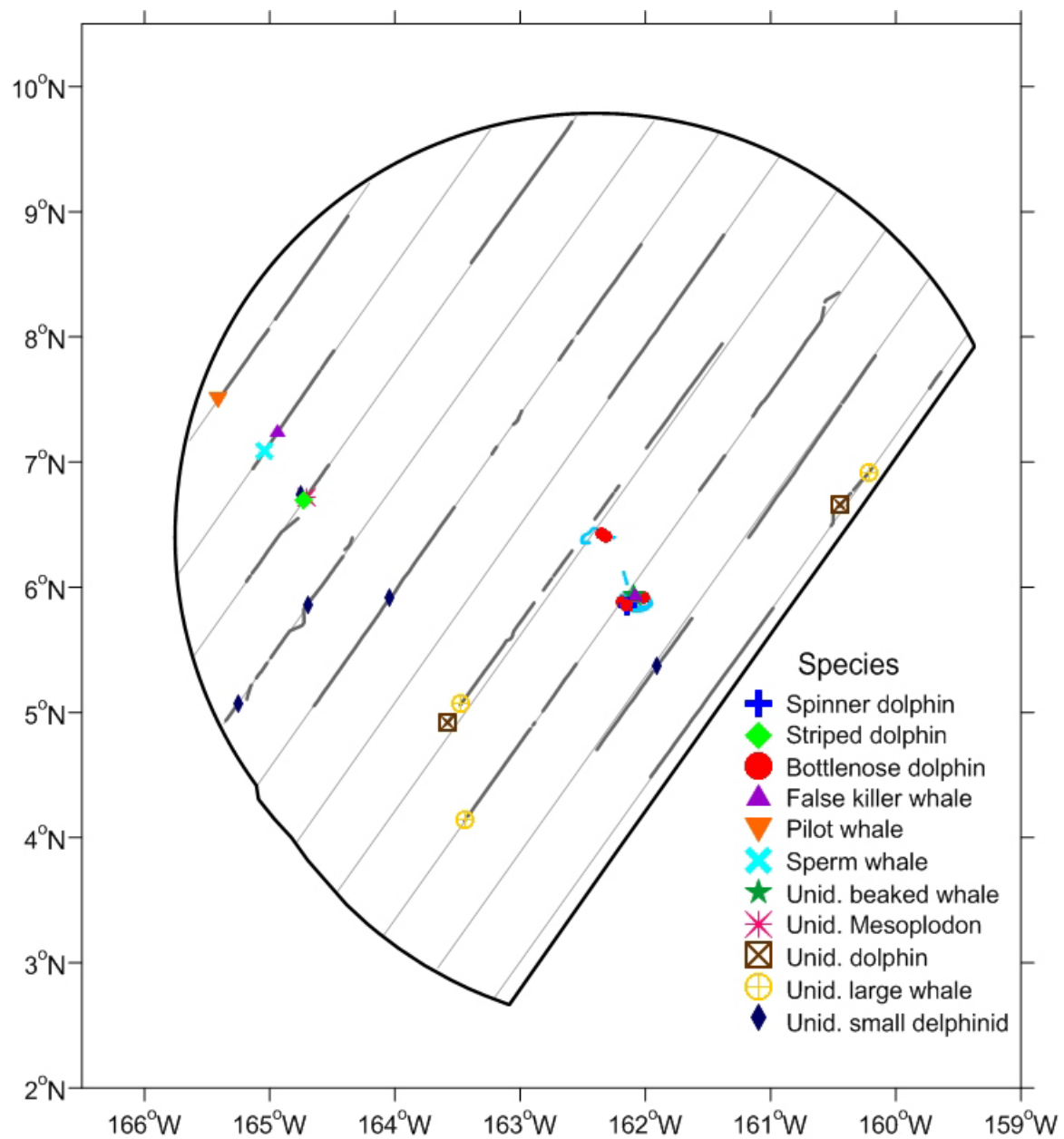


Figure 2.--Visual cetacean sightings made while surveying standard (dark gray) and non-standard (sky blue) tracklines within the Palmyra Atoll EEZ (black outline). The light gray lines represent the full 2005 PICEAS trackline grid.